

REMARKS

This is a full and timely response to the Office Action mailed August 4, 2008, submitted concurrently with a Request for Continued Examination and a third month extension of time to extend the due date for response to February 4, 2009.

By this Amendment, claim 1 has been amended to more particularly define the present invention. Further, claim 6 has been canceled without prejudice or disclaimer to its underlying subject matter. Thus, claims 1-5 are currently pending in this application, with claim 5 being withdrawn. Support for the claim amendments can be readily found variously throughout the specification and the original claims, see, in particular, page 6, line 8, and page 14, lines 10-15, of the specification.

In view of these amendments, Applicant believes that all pending claims are in condition for allowance. Reexamination and reconsideration in light of the above amendments and the following remarks is respectfully requested.

Rejection under 35 U.S.C. §112

Claim 6 is rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite. This rejection has been rendered moot by the cancellation of the rejected claim.

Rejection under 35 U.S.C. §103

Claims 1-4 and 6 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Smart (U.S. Patent No. 6,337,462 B1). With regard to claim 6, this rejection has been rendered moot. With regard to claims 1-4, Applicant respectfully traverses this rejection.

To establish a *prima facie* case of obviousness, the prior art reference must teach or suggest all the claim limitations, and provide some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Here, in this case, the cited reference, Smart, fails to teach or suggest all the claim limitations with particular emphasis on the limitations “*wherein the optimum wavelength of light permits a region of an internal material portion of the brittle material and the surface vicinity of the brittle material to become an absorbing region by the irradiation of*

the light onto the brittle material", "wherein the optimum wavelength of light allows for the generation of an uniform heating band in the thickness direction and the formation of cracks deep in the internal portion of the brittle material", "wherein the absorptance (A) of the plate-shaped sample is calculated by Formula (I),

$$A = 100 - (100)^{D/d} B^{d/D} \quad (I),$$

based on a thickness (D) of the brittle material to be processed, the thickness (d) of the plate-shaped sample, and a predetermined transmittance (B)", and "wherein the light source is made to emit the light having the optimum wavelength such that the actual absorptance of the plate-shaped sample is near the calculated absorptance (A)".

The Examiner has maintained the present prior art rejection on the basis that Smart contains teachings which read on the limitation of the claims (i.e. *"wherein the optimum wavelength of light permits a region of an internal material portion of the brittle material and the surface vicinity of the brittle material to become an absorbing region by the irradiation of the light onto the brittle material"*). More specifically, the Examiner notes that Smart explicitly teaches that *"~1% of the energy is absorbed for the "optimal wavelength" of 1.2 microns at a depth of x=1 mm and that 86.5% is absorbed at the alternate wavelength of 1.047 microns"*. The Examiner believes that in both of these cases, photons are absorbed both at the surface vicinity of the material as well as at an internal material portion (e.g. at a depth of 1 mm). Hence, the Examiner argues that Smart does teach a methodology as claimed for selecting an optimal wavelength which permits *"a region of an internal material portion of the brittle material and the surface vicinity of the brittle material to become an absorbing region by the irradiation of the light onto the brittle material"*. However, Applicant believes that the Examiner's understanding of Smart and the present invention is incorrect and wishes to correct the Examiner's understanding in this regard.

From Applicant review of Smart, it is clear that the equation, $\text{Absorption} = 1 - I/I_0 = 1 - \exp(-\alpha x)$, in column 6, line 3, is intended to describe the difference of energy absorption (energy absorptance) between two different wavelengths, based on the absorption coefficient graphs in Figs. 1 and 2, and thereby to give the difference as the energy absorption of a 1-mm-thick sample. Smart discloses the equation, $\text{Absorption} = 1 - I/I_0 = 1 - \exp(-\alpha x)$, for the purpose of demonstrating that a very slight change in wavelength shows a drastic change in absorption. Such a showing allows

Smart to justify operating a laser at a wavelength beyond the absorption edge of the substrate to circumvent damage to the substrate.

As noted in Applicant's response filed April 25, 2008, Smart discloses a wavelength shifter for shifting the wavelength of the laser output from a conventional wavelength to a wavelength **beyond the absorption edge** of the substrate but shorter than 1.2 μm in order to obtain a **decrease in absorption** of the laser output by the substrate due to the shift in the wavelength of the laser output. The purpose of such a wavelength shifter is to minimize thermal processing damage to the substrate.

In contrast, the present invention features using a plate-shaped sample (*of a same material as the brittle material to be processed*) to select an optimal wavelength of light for the absorptance of the processed brittle material. The optimal wavelength is selected based on a calculated value of absorptance and actual absorptance data obtained by the irradiation of light onto the plate-shaped sample. *The optimum wavelength of light permits a region of an internal material portion of the brittle material and the surface vicinity of the brittle material to become an absorbing region by the irradiation of the light onto the brittle material thereby "allowing the generation of an uniform heating band in the thickness direction and the formation of cracks deep in the internal portion of the brittle material".* Thus, it is clear that Smart does not teach or suggest all the limitations of the claims.

Furthermore, regarding the use of an optimum wavelength of light for processing a material, Smart never discloses or suggests that the absorptance in a sample having a predetermined thickness is calculated (via a formula) based on a given absorptance value for the material, and that the calculated value is compared with actual absorptance data for the sample having a predetermined thickness (*see the newly added limitations of amended claim 1*).

Also, Applicant believes that one skilled in the art would not be motivated to modify the teachings of Smart to arrive at the present invention. Since the main purpose of Smart is to shift the wavelength of the laser output from a conventional wavelength to a wavelength **beyond the absorption edge of the substrate to minimize thermal processing damage to the substrate**, one skilled in the art would not be motivated to select an optimum wavelength of light as in the present invention to allow for **"the generation of an uniform heating band in the thickness direction and the**

formation of cracks deep in the internal portion of the brittle material". Applicant believes that such a result is in direct conflict with the main purpose of Smart. Under U.S. practice, if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, or would change the principle of operation of the prior art invention being modified, then the teachings of the reference(s) are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).

Lastly, Applicant again notes that a *prima facie* case of obviousness can be rebutted if the claimed process possesses unexpected and superior properties not taught in the prior art. In this regard, Applicant wishes to re-emphasize to the Examiner that in the present invention, the brittle material can be heated in the surface vicinity substantially simultaneously to the heating of the internal material portion thereby allowing the necessary temperature increase to be obtained within a short time (with the only delay caused by the speed of light propagation). This, in turn, greatly accelerates the processing speed of the brittle material. Such superior features of the present invention is not at all taught or suggested in Smart.


Thus, for these reasons, withdrawal of the present rejection is respectfully requested

CONCLUSION

For the foregoing reasons, all the claims now pending in the present application are believed to be clearly patentable over the outstanding rejections. Accordingly, favorable reconsideration of the claims in light of the above remarks is courteously solicited. If the Examiner has any comments or suggestions that could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the below-listed number.

Dated: February 4, 2009

Respectfully submitted,

By:  _____

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